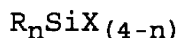


CLAIMS

We claim:

Sub B1

1. A ^{siloxane}~~silsesquioxane~~ polymer, useful for preparing SiO₂-rich films, which comprises the polymeric reaction product obtained from the hydrolysis and condensation polymerization of an organosilane containing a β-substituted alkyl group, the organosilane having the general formula:



where n is 1 or 2;

X is a halogen selected from the group consisting of chlorine, bromine, fluorine, and iodine; or an alkoxy selected from the group consisting of methoxy, ethoxy and propoxy substituents; and

R is an alkyl group having at least one but not more than two β-substituents that are electronegative; and wherein said polymeric reaction product contains silanol groups.

2. The ^{siloxane}~~silsesquioxane~~ polymer of claim 1 wherein, in the general formula for the organosilane, R is an ethyl group or propyl group having at least one but not more than two β-substituents selected from the group consisting of ~~chlorine~~, bromine, fluorine, iodine, hydroxy, methoxy, ethoxy, and acetoxy.

3. The ^{siloxane}~~silsesquioxane~~ polymer of claim 1 which further comprises at least one but not more than two

Sub B1

~~α -substituents on the β -substituted alkyl group, the α -substituent being selected from the group consisting of chlorine, bromine, fluorine, iodine, hydroxy, methoxy, ethoxy, and acetoxy.~~

~~SILOXANE~~

4. The ~~silsesquioxane~~ polymer of claim 3 wherein the α -substituent is the same as the β -substituent on the alkyl group.

Sub B2

~~SILOXANE~~

5. The ~~silsesquioxane~~ polymer of claim 1 wherein, in the general formula for the organosilane, n is 1;

X is a halogen selected from the group consisting of chlorine and bromine or an alkoxy selected from the group consisting of methoxy and ethoxy substituents; and

R is an ethyl group having at least one but not more than two β -substituents selected from the group consisting of ~~chlorine~~, bromine, fluorine, hydroxy, methoxy, and acetoxy.

~~SILOXANE~~

6. The ~~silsesquioxane~~ polymer of claim 5 which further comprises at least one but not more than two α -substituents on the β -substituted ethyl group, the α -substituent being selected from the group consisting of chlorine, bromine, fluorine, hydroxy, methoxy, and acetoxy.

~~Siloxane~~

7. The ~~silsesquioxane~~ polymer of claim 6 wherein the α -substituent is the same as the β -substituent on the ethyl group.

~~Siloxane~~

8. The ~~silsesquioxane~~ polymer of claim 1 wherein the polymeric reaction product is obtained from the hydrolysis and condensation polymerization of a β -substituted ethyltrichlorosilane, wherein the β -substituent is non-halogenated.

~~Siloxane~~

9. The ~~silsesquioxane~~ polymer of claim 1 wherein the polymeric reaction product contains at least about five up to about 75 silanol groups per 100 silicon atoms.

~~Siloxane~~

10. The ~~silsesquioxane~~ polymer of claim 1 wherein the polymeric reaction product contains about 20 to about 50 silanol groups per 100 silicon atoms.

~~Siloxane~~

11. The ~~silsesquioxane~~ polymer of claim 1 wherein the polymeric reaction product is obtained from homopolymerization of the organosilane.

~~Siloxane~~

12. The ~~silsesquioxane~~ polymer of claim 1 wherein the polymeric reaction product is obtained from copolymerization of the organosilane with an alkoxysilane.

~~Siloxane~~

13. The ~~silsesquioxane~~ polymer of claim 12 wherein the alkoxysilane is selected from the group

consisting of tetraethoxysilane (TEOS), tetramethoxysilane (TMOS), methoxytriethoxysilane, triethoxychlorosilane, ~~bis(β -chloroethyl)dichlorosilane~~, bis(trimethoxysilyl)-ethane, methyltriethoxysilane, vinyltriethoxysilane, pentafluorophenyltriethoxysilane and tridecafluorooctyl-1H,2H,2H-octyltriethoxysilane.

Sub B4

14. The ^{Siloxane}~~silsesquioxane~~ polymer of claim 1 which further comprises a polymeric reaction product obtained from copolymerization of the organosilane with a hydride-functional silane selected from the group consisting of trichlorosilane and triethoxysilane.

15. The ^{Siloxane}~~silsesquioxane~~ polymer of claim 1 which further comprises a polymeric reaction product obtained from copolymerization of the organosilane with an organotrichlorosilane selected from the group consisting of ethyltrichlorosilane, methyltrichlorosilane and phenyltrichlorosilane.

16. The ^{Siloxane}~~silsesquioxane~~ polymer of claim 1 wherein the reaction is carried out by the addition of the organosilane to an aqueous medium.

Sub B5

17. The ^{Siloxane}~~silsesquioxane~~ polymer of claim 16 wherein the polymeric reaction product is extracted from the aqueous medium with an organic solvent.

siloxane

~~siloxane~~

~~silsesquioxane~~

18. A homogeneous liquid containing the silsesquioxane polymer of claim 1 and an organic solvent for dissolving the silsesquioxane polymer, the solvent being selected from the group consisting of aromatic hydrocarbons and their epoxy-functional derivatives, glycol ethers, alkanes and their epoxy-functional derivatives, ketones, esters, orthoesters, chlorinated hydrocarbons, chlorofluorocarbons and alcohols.

19. The homogeneous liquid according to claim 18, wherein the organic solvent is selected from the group consisting of diglyme, methoxypropanol and toluene.

20. The homogeneous liquid according to claim 19, wherein the organic solvent is diglyme and the solubility of the siloxane polymer in the organic solvent is at least 15% by weight, based on the weight of the solution.

Add A17

Add B7

Add D1